5.17 Sector Areas and Arc Lengths: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

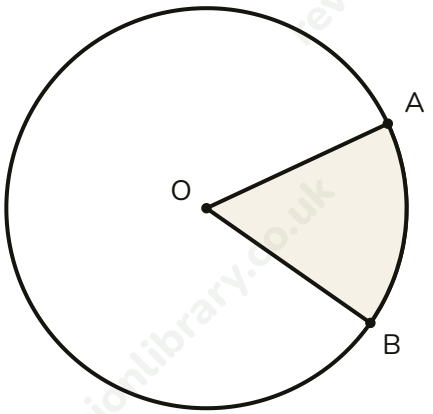
Answer ALL questions. Show all your working.

1 A circle has radius 7 cm. Work out the circumference of the whole circle. Give your answer to 1 decimal place. Use $\pi = 3.14159$.

(Total for Question 1 is 1 mark)

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2 The diagram shows a circle with centre O. Points A and B lie on the circumference. Radii OA and OB are drawn, and the minor arc AB is marked. The region enclosed by OA, OB and the arc AB is shaded.



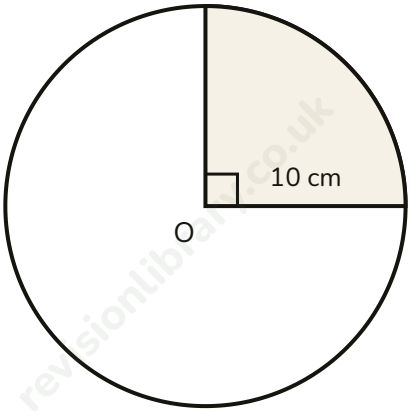
- ☐ A) Segment
- ☐ B) Sector
- ☐ C) Chord
- ☐ D) Semicircle

(Total for Question 2 is 1 mark)

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3 A sector of a circle has centre O and radius 10 cm. The angle at the centre is 90 degrees.
Calculate the area of the sector, giving your answer to 3 significant figures.

Diagram NOT accurately drawn

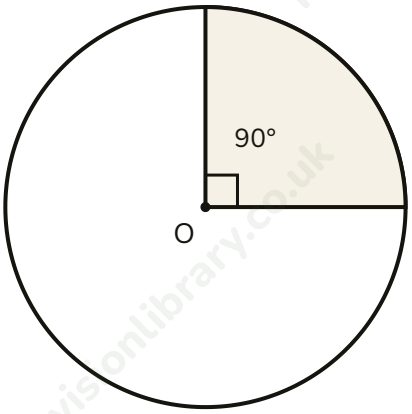


(Total for Question 3 is 2 marks)

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4 The diagram shows a sector of a circle with centre O. The angle at the centre is 90 degrees.

Diagram NOT accurately drawn



(a) Write the sector's angle as a fraction of 360 degrees. Give your answer in its simplest form. **(1)**

.....

(b) Write this fraction as a percentage. **(1)**

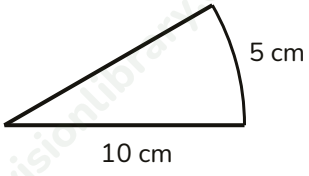
.....

(Total for Question 4 is 2 marks)

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5 The arc length of a sector is 5 cm and the radius of the circle is 10 cm. Work out the angle of the sector in degrees. Give your answer to 1 decimal place. Use $\pi = 3.14159$.

Diagram NOT accurately drawn

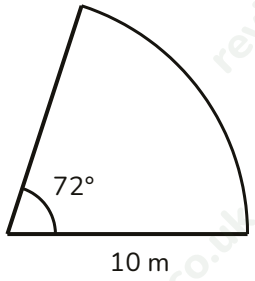


(Total for Question 5 is 3 marks)

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6 Find the arc length of a sector with radius 10 m and central angle 72 degrees. Give your answer in metres, correct to 3 significant figures.

Diagram NOT accurately drawn

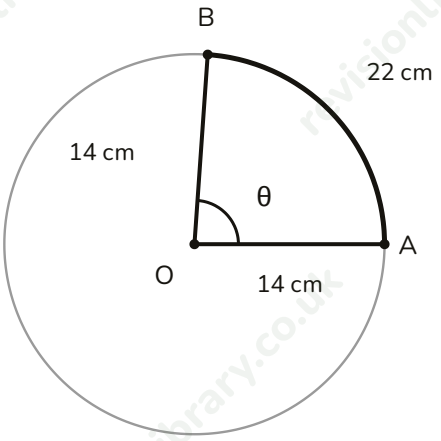


(Total for Question 6 is 2 marks)

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7 An arc of a circle has length 22 cm. The radius of the circle is 14 cm. Calculate the angle of the sector, giving your answer to the nearest degree.

Diagram NOT accurately drawn

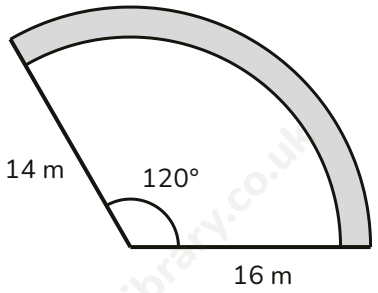


(Total for Question 7 is 4 marks)

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8 A circular garden has radius 14 m. A path is made that follows an arc of 120 degrees around the garden. The path is 2 m wide and runs along the outside edge of the garden (so the outer radius is 16 m). Work out the area of the path only. Give your answer to 1 decimal place. Use $\pi = 3.14159$.

Diagram NOT accurately drawn

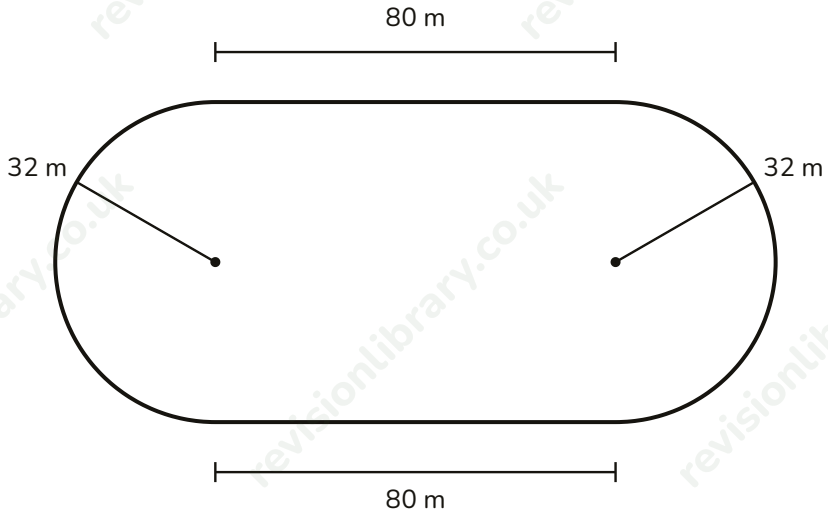


(Total for Question 8 is 4 marks)

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9 A school running track is made from two straight sections and two semicircular ends. Each straight section is 80 m long. Each semicircular end has a radius of 32 m.

Diagram NOT accurately drawn



(a) Calculate the total distance around one complete lap of the track, giving your answer correct to 3 significant figures. **(3)**

.....

(b) Anwar runs 5 complete laps of the track. Calculate the total distance he runs, in kilometres, giving your answer correct to 3 significant figures. **(3)**

.....

(Total for Question 9 is 6 marks)

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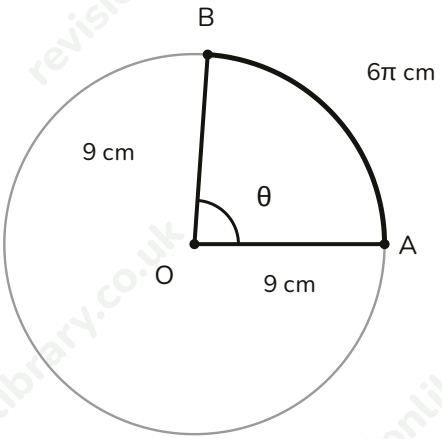
10 A sector of a circle has radius r and centre angle x degrees. Its area is A and its arc length is s. Show that A = (1/2) r s. You must show the steps that lead to this result.

(Total for Question 10 is 3 marks)

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11 A sector of a circle has radius 9 cm. The arc length of the sector is exactly 6pi cm.

Diagram NOT accurately drawn



(a) Find the angle of the sector. **(2)**

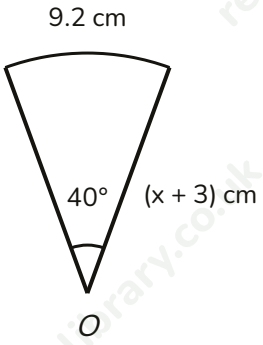
(b) Hence find the exact area of the sector, giving your answer in terms of π. **(3)**

(Total for Question 11 is 5 marks)

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12 A sector of a circle has radius (x + 3) cm and angle 40 degrees. The arc length of the sector is 9.2 cm. Form an equation in x and solve it to find the value of x, giving your answer correct to 3 significant figures.

Diagram NOT accurately drawn

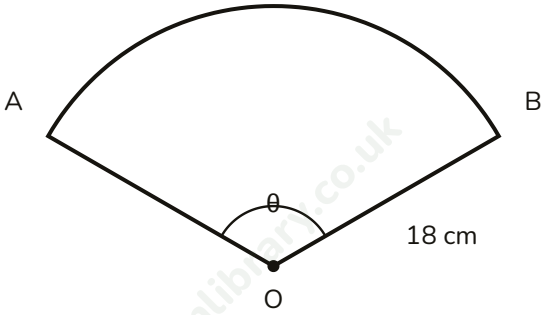


(Total for Question 12 is 4 marks)

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13 A sector-shaped garden ornament is cut from a sheet of metal. The sector has radius 18 cm. Its perimeter (the two straight edges plus the curved arc) is 54 cm. The metal costs £0.09 per cm^2.

Diagram NOT accurately drawn



Perimeter = 54 cm

(a) Show that the arc length of the sector is 18 cm. **(2)**

(b) Find the angle of the sector, giving your answer correct to 1 decimal place. **(2)**

.....

(c) Find the area of the sector, giving your answer correct to 3 significant figures. **(2)**

.....

(d) Calculate the cost of the metal needed for the ornament. **(1)**

.....

(Total for Question 13 is 7 marks)

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Mark scheme · 5.17 Sector Areas and Arc Lengths: Test Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

43.9823... rounded to 44.0 cm cao **B1**

Answer: 44.0 cm

Question 2

B (Sector) **B1**

Answer: B

Question 3

(90/360) x π x 10^2 oe, or π x 10^2 = 314... seen **M1**

awrt 78.5 (cm^2) **A1**

Answer: 78.5 cm^2

Question 4

(a) 1/4 oe, must be simplified **B1**

(a) Answer: 1/4

(b) 25% ft their fraction from part (a) **B1**

(b) Answer: 25%

Question 5

use arc = (angle/360) * 2 * π * r so angle = arc * 360 / (2 * π * r) **M1**

substitute angle = 5 * 360 / (2 * π * 10) and simplify **M1**

28.6 degrees cao (28.6479... -> 28.6 degrees) **A1**

Answer: 28.6 degrees

Question 6

use arc length = 2 π r * angle/360 or r * θ in radians **M1**

4 π m = 12.566... so 12.6 m awrt **A1**

Answer: 12.6 m

Question 7

sets up 22 = (θ/360) x 2 x π x 14 oe **M1**

rearranges to θ = 22 x 360 / (2 x π x 14) oe **M1**

90.0... seen (awrt 90.0) **A1**

90 degrees cao, to the nearest degree **A1**

Answer: 90 degrees (nearest degree)

Question 8

area path = fraction (120/360) * (π * R^2 - π * r^2) **M1**

substitute R = 16, r = 14 so area = 1/3 * π * (256 - 196) = 1/3 * π * 60 **M1**

calculate 1/3 * 60 = 20 so area = 20 * π **M1**

62.8318... -> 62.8 m^2 (1 dp) **A1**

Answer: 62.8 m^2

Question 9

(a) 2 x π x 32 oe (recognising the two semicircular ends combine to make one full circle) **M1**

(a) their circle circumference + (2 x 80) (adds the two straight sections) **M1**

(a) awrt 361 (m) **A1**

(a) Answer: 361 m

(b) their (a) x 5 (= 1805...) (correct multiplication by 5 laps) **M1**

(b) their distance in m / 1000 (correct conversion to km) **M1**

(b) awrt 1.81 (km) ft their (a) **A1**

(b) Answer: 1.81 km

Question 10

state A = (x/360) * π r^2 and s = (x/360) * 2 π r or equivalent **M1**

eliminate x, e.g. x/360 = s/(2 π r) substituted into the area formula, or A/s = (π r^2)/(2 π r) **M1**

conclude A = (s/(2 π r)) * π r^2 = 1/2 r s cso **A1**

Answer: A = 1/2 r s

Question 11

(a) sets up 6pi = (θ/360) x 2 x π x 9 oe, i.e. 6pi = (θ/360) x 18pi **M1**

(a) θ = 120 degrees cao **A1**

(a) Answer: 120 degrees

(b) identifies fraction 120/360 = 1/3 oe **M1**

(b) (1/3) x π x 9^2 oe **M1**

(b) 27pi cm^2 cao (exact; do not accept a decimal-only answer) **A1**

(b) Answer: 27pi cm^2 (= 84.8 cm^2 to 3 s.f.)

Question 12

sets up 9.2 = (40/360) x 2 x π x (x + 3) oe **M1**

rearranges to (x + 3) = 9.2 x 360 / (2 x π x 40) oe **M1**

x + 3 = 13.1... seen (awrt 13.2) **A1**

x = 10.2 awrt, cao **A1**

Answer: x = 10.2 (3 s.f.)

Question 13

(a) perimeter = 2 x 18 + arc length, i.e. 54 = 36 + arc length oe **M1**

(a) arc length = 54 - 36 = 18 cm, correctly shown **A1**

(a) Answer: arc length = 18 cm (shown)

(b) sets up 18 = (θ/360) x 2 x π x 18 oe **M1**

(b) θ = 57.3 degrees awrt, cao **A1**

(b) Answer: 57.3 degrees (1 d.p.)

(c) (their θ / 360) x π x 18^2 oe, ft their part (b) **M1**

(c) 162 cm^2 awrt, cao **A1**

(c) Answer: 162 cm^2 (3 s.f.)

(d) their part (c) area x 0.09, cao = £14.58 (accept £14.58 or £14.58) **B1ft**

(d) Answer: £14.58

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